

Use of EOS-Aura Observations in the MERRA-2 Reanalysis

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Meteorological reanalyses provide multi-year gridded datasets that describe the evolution of the atmosphere. Such products use a data assimilation system, comprising of an atmospheric model, a broad suite of observations, and an analysis system that optimally combines the model forecast with the observations, using an algorithm that includes information about model and data accuracy. The mixture of observations is of central importance to the quality of the assimilated datasets. The Modern-era Retrospective Analysis for Research and Applications (MERRA) included constraints on the thermal structure of the middle atmosphere from nadir sounders on the NOAA polar-orbiting platforms (Stratospheric Sounding Units and Advanced Microwave Sounding Units). These instruments have peak sensitivities that occur well below the stratopause. As such, the radiance measurements do not provide strong constraints on stratopause temperature. The new MERRA-2 reanalysis is using EOS-MLS temperature retrievals after they are available: it will be demonstrated that these data lead to a more realistic stratopause structure in MERRA-2 than in MERRA. Similarly, the work demonstrates the improvements in lower stratospheric ozone in MERRA-2 than in MERRA, for the period when EOS-MLS ozone data are assimilated. This improvement occurs because of the ozone profile information offered by MLS in the low stratosphere, in contrast to the SBUV/2 data used for the rest of MERRA-2. The impacts of choosing to use the EOS-MLS datasets are discussed in context of the continuity of the data record in MERRA-2.